



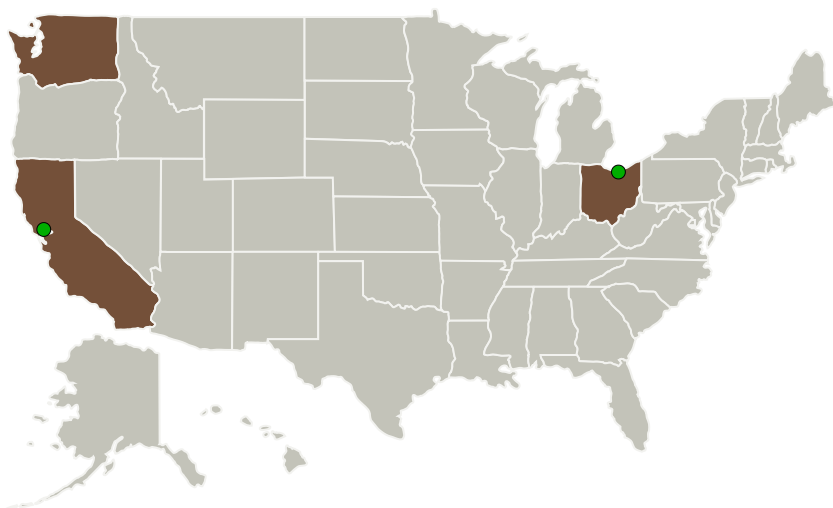
## Project Introduction

The goal of the PTD-1 mission is to demonstrate the Tethers Unlimited Inc. (TUI) HYDROS water fueled thruster. The development of this thruster was supported through a public-private partnership between TUI and NASA. The HYDROS is intended to provide safe, high-performance propulsion for secondary payloads. The propulsion system is launched with only liquid water as the propellant and then uses electrolysis to split the water into gaseous hydrogen and oxygen for a simple bipropellant thruster once deployed on-orbit. This orbital flight test is part of the Pathfinder Technology Demonstration series of missions where the spacecraft, payload integration, and operations are provided under a commercial contract with Tyvak Nano-Satellite System, Inc.

## Anticipated Benefits

Launching with only unpressurized liquid water as the spacecraft propellant precursor provides safety benefits and risk mitigation. This allows small spacecraft to be hosted on a wider variety of missions as secondary payloads, while still carrying a propulsion system that provides high thrust. The HYDROS system also provides a potential platform for the future ISRU of water harvested in space for refueling. In-flight demonstration of this thruster will de-risk the technology for future mission use.

## Primary U.S. Work Locations and Key Partners

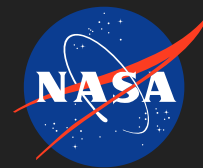


NASA's Pathfinder Technology Demonstrator (PTD) project will test the operation of a variety of novel CubeSat technologies in low- Earth orbit, providing significant enhancements to the performance of these small and effective spacecraft.

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## Pathfinder Technology Demonstrator 1 (PTD-1) - TUI HYDROS



Completed Technology Project (2018 - 2021)

Organizations Performing Work	Role	Type	Location
Tyvak Nano-Satellite Systems Inc.	Lead Organization	Industry	Irvine, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
Tethers Unlimited Inc	Supporting Organization	Industry	

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Tyvak Nano-Satellite Systems Inc.

**Responsible Program:**

Small Spacecraft Technology

## Project Management

**Program Director:**

Christopher E Baker

**Program Manager:**

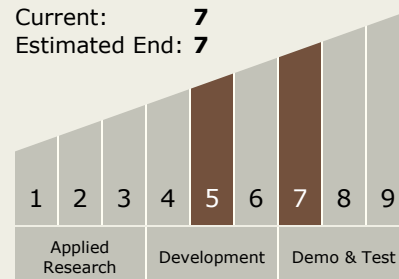
Roger Hunter

**Principal Investigator:**

Elwood F Agasid

## Technology Maturity (TRL)

Start: 5  
 Current: 7  
 Estimated End: 7



## Primary U.S. Work Locations

California	Ohio
Washington	

## Project Transitions

▶ **March 2018:** Project Start

✓ **June 2021:** Closed out

**Closeout Summary:** On orbit demonstration of novel Water Electrolysis > Hydrogen/oxygen in-space propulsion system in a CubeSat (approximately 20x10x15cm) form factor. The vendor, Tethers Unlimited Inc., has plans/contracts to deliver flight units to other space projects.

**Closeout Documentation:**

- HYDROS-C PTD-1 Tipping Point Final Report(<https://techport.nasa.gov/file/102869>)



## Images



### Pathfinder Technology Demonstrator (PTD).png

NASA's Pathfinder Technology Demonstrator (PTD) project will test the operation of a variety of novel CubeSat technologies in low-Earth orbit, providing significant enhancements to the performance of these small and effective spacecraft.

(<https://techport.nasa.gov/image/102863>)

### Project Website:

[https://www.nasa.gov/directorates/spacetech/small\\_spacecraft/index.html#.Vt](https://www.nasa.gov/directorates/spacetech/small_spacecraft/index.html#.Vt)

## Technology Areas

### Primary:

- TX01 Propulsion Systems

## Target Destinations

Earth, The Moon, Others Inside the Solar System